

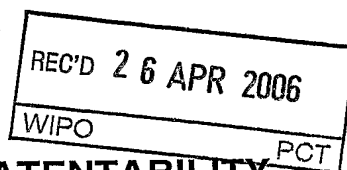
PATENT COOPERATION TREATY


PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference B3148-PCT		FOR FURTHER ACTION		See Form PCT/PEA/416
International application No. PCT/EP2004/013436		International filing date (day/month/year) 26.11.2004		Priority date (day/month/year) 26.11.2003
International Patent Classification (IPC) or national classification and IPC INV. G09G3/20				
Applicant BARCO N.V. et al.				
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 7 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 5 sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>				
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the report</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input checked="" type="checkbox"/> Box No. VI Certain documents cited</p> <p><input checked="" type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application</p>				
Date of submission of the demand 26.09.2005		Date of completion of this report 25.04.2006		
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized officer Gundlach, H Telephone No. +49 89 2399-8073		



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Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
 - ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
 - ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-25 as originally filed

Claims, Numbers

1-18 received on 26.09.2005 with letter of 26.09.2005

Drawings, Sheets

1/4-4/4 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☒ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☒ the claims, Nos. 19, 20
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-18
	No: Claims	
Inventive step (IS)	Yes: Claims	1-18
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-18
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Box No. VI Certain documents cited

1. Certain published documents (Rule 70.10)

and / or

2. Non-written disclosures (Rule 70.9)

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1 Reference is made to the following document:

D1: US-A-5504504

2 Document D1, which is at present considered to represent the closest state of the art with regard to **claim 1**, discloses improvements in and relating to spatial light modulators (see D1, title). More specifically, D1 discloses a method for reducing the visual impact of defects present in a matrix display comprising a plurality of display elements, the method having the following steps:

- providing a representation of a human vision system (see "sinc function" in D1, col. 7, lines 29 - 40 & col. 7, last paragraph);
- characterising at least one defect present in the display (see "defective pixel map" 2910 in D1, col. 12, lines 7 - 51);
- deriving drive signals for at least some of the plurality of non-defective display elements in accordance with the representation of the human vision system and the characterising of the at least one defect, to thereby minimise an expected response of the human vision system to the defect (see D1, col. 11, lines 53 - 59 & col. 9, lines 42 - 52); and
- driving at least some of the plurality of non-defective display elements with the derived drive signals (see D1, col. 11, line 57).

Moreover, for commercially sold displays it has to be assumed that at least a part of the defects is surrounded by a plurality of non-defective display elements (see D1, Fig. 7, 8).

3 Contribution to State of the Art / Problem to be solved

The application contributes in the independent method claim 1 essentially the distinguishing features:

- that the method is applied to a matrix display with pixels comprising at least three sub-pixels, each sub-pixel intended for generating a sub-pixel colour which cannot be obtained by a linear combination of the sub-pixel colours of the other sub-pixels of the pixel, and
- that the minimising the response of the human vision system to the defect sub-pixel comprises changing the light output of at least one non-defective sub-pixel intended for generating another sub-pixel colour, the another sub-pixel colour differing from the first sub-pixel colour.

The subject-matter of claim 1 is therefore novel (Article 33(2) PCT).

System claim 9, device claims 16 and 18 contribute corresponding features and are therefore also novel (Article 33(2) PCT).

These features are related to the problem how to compensate faults in colour displays.

4 Inventive Step

None of the prior art at hand discloses the same solution:

The objective of D1 is to compensate faults in displays, i.e. it is silent on special problems or specially adapted solutions with regard to colour displays. So, D1 does not handle the problem to be solved. Moreover, D1 does not hint at the distinguishing feature.

Therefore, the person skilled in the art can't combine the prior art documents in order to derive the distinguishing feature.

Hence, the solution proposed in the independent claims 1, 9, 16 and 18 of the present application is considered as involving an inventive step (Article 33(3) PCT).

5 Dependent Claims / Industrial Applicability

Claims 2 - 8, 10 - 15 and 17 are dependent on claims 1, 9 and 16, respectively, and as such also meet the requirements of the PCT with respect to novelty and inventive

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step (Article 33(2) and 33(3) PCT).

The industrial applicability (Article 33(4) PCT) of the subject-matter of all claims is given in an obvious manner.

Re Item VI

Certain documents cited

Certain published documents

Application No	Publication date	Filing date	Priority date (<i>valid claim</i>)
Patent No	(<i>day/month/year</i>)	(<i>day/month/year</i>)	(<i>day/month/year</i>)
WO03/100756	4.12.2003	29.4.03	27.05.2002

Re Item VII

Certain defects in the international application

6 The application has a number of deficiencies:

6.1 The independent claims are not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (document D1) being placed in the preamble (Rule 6.3(b)(I) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).

6.2 The description is not in conformity with the claims as required by Rule 5.1(a)(iii) PCT (see e.g. page 21, lines 15 - 22).

Re Item VIII

Certain observations on the international application

6.3 It should be noted that according to the description of the present application (see

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page 17, lines 18 - 23) the features related to the representation of a human vision system by the calculation of an expected response of a human eye to a stimulus applied to a sub-pixel are essential for the functioning of a method or device able to overcome the problems of the prior art as indicated (see page 3, lines 20 - 22).

Since the independent claims 16 and 18 do not contain these features, they do not meet the requirement following from Article 6 PCT taken in combination with Rule 6.3(b) PCT that any independent claim must contain all the technical features essential to the definition of the invention.

CLAIMS

- 1.- A method for reducing the visual impact of defects present in a matrix display (12) comprising a plurality of pixels (14), said pixels (14) comprising at least three sub-pixels (20, 21, 22), each sub-pixel intended for generating a sub-pixel colour which cannot be obtained by a linear combination of the sub-pixel colours of the other sub-pixels of the pixel, the method comprising:
- providing a representation of a human vision system by calculating an expected response of a human eye to a stimulus applied to a sub-pixel, characterising at least one defect sub-pixel present in the display, the at least one sub-pixel intended for generating a first sub-pixel colour, the defect sub-pixel being surrounded by a plurality of non-defective sub-pixels,
- deriving drive signals for at least some of the plurality of non-defective sub-pixels in accordance with the representation of the human vision system and the characterising of the at least one defect sub-pixel, to thereby minimise an expected response of the human vision system to the defect sub-pixel, and
- driving at least some of the plurality of non-defective sub-pixels with the derived drive signals,
- wherein minimising the response of the human vision system to the defect sub-pixel comprises changing the light output value of at least one non-defective sub-pixel intended for generating another sub-pixel colour, said another sub-pixel colour differing from said first sub-pixel colour.
- 2.- A method according to claim 1, wherein minimising the response of the human vision system to the defect sub-pixel comprises introducing a light output deviation in at least one non-defective sub-pixel being part of the same pixel as said defect sub-pixel.
- 3.- A method according to claim 2, wherein said light output deviation is similar to a light output deviation caused by the defect sub-pixel.

- 4.- A method according to claim 2, wherein said light output deviation is such that a total light output of said pixel is substantially equal to a total light output of that pixel if it would not have any defect sub-pixels.
- 5.- A method according to any of the previous claims, wherein deriving drive signals for at least some of the plurality of non-defective sub-pixels furthermore is performed by incorporating a correction for at least one of a distance between said human vision system and said display, a viewing angle between said human vision system and said display and a presence of environmental stray light.
- 10 6.- A method according to any of the previous claims, wherein characterising at least one defect sub-pixel present in the display comprises storing characterisation data characterising the location and non-linear light output response of individual sub-pixels, the characterisation data representing light outputs of an individual sub-pixel as a function of its
- 15 drive signals.
- 7.- A method according to any of the previous claims, wherein for calculating the expected response of a human eye to a stimulus applied to a sub-pixel, use is made of any of a point spread function, a pupil function, a line spread function, an optical transfer function, a modulation transfer
- 20 function or a phase transfer function of the eye.
- 8.- A method according to any of the previous claims, wherein when minimising the response of the human vision system to the defect sub-pixel, boundary conditions are taken into account.
- 9.- A system for reducing the visual impact of defects present in a matrix
- 25 display comprising a plurality of pixels, said pixels comprising at least three sub-pixels, each sub-pixel intended for generating a sub-pixel colour which cannot be obtained by a linear combination of the sub-pixel colours of the other sub-pixels of the pixel, and intended to be looked at by a human vision system, first characterisation data for a human vision system being provided by a vision characterising device having
- 30 calculating means for calculating the response of a human eye to a stimulus applied to a sub-pixel, the system comprising:
a defect characterising device for generating second characterisation

- data for at least one defect sub-pixel present in the display, the defect sub-pixel intended for generating a first sub-pixel colour and being surrounded by a plurality of non-defective sub-pixels,
- 5 a correction device for deriving drive signals for at least some of the plurality of non-defective sub-pixels in accordance with the first characterisation data and the second characterising data, to thereby minimise an expected response of the human vision system to the defect sub-pixel, and
- 10 means for driving at least some of the plurality of non-defective sub-pixels with the derived drive signals,
- wherein the correction device comprises means to change the light output value of at least one non-defective sub-pixel intended for generating another sub-pixel colour, said another sub-pixel colour differing from said first sub-pixel colour.
- 15 10.- A system according to claim 9, wherein the correction device comprises means for introducing a light output deviation in at least one non-defective sub-pixel being part of the same pixel as said defect sub-pixel.
- 11.- A system according to claim 10, wherein said light output deviation is similar to a light output deviation caused by the defect sub-pixel.
- 20 12.- A system according to claim 10, wherein said light output deviation is such that a total light output of said pixel is substantially equal to a total light output of a pixel if it would not have any defect sub-pixels.
- 13.- A system according to any of claims 9 to 12, wherein the correction device for deriving driving signals is adapted for deriving driving signals
- 25 incorporating a correction for at least one of a distance between said human vision system and said display, a viewing angle between said human vision system and said display and a presence of environmental stray light.
- 14.- A system according to any of claims 9 to 13, wherein the defect sub-pixel
- 30 characterising device comprises an image capturing device for generating an image of the sub-pixels of the display.

- 15.- A system according to any of claims 9 to 14, wherein the defect sub-pixel characterising device comprises a sub-pixel location identifying device for identifying the actual location of individual sub-pixels of the display.
- 5 16.- A matrix display device for displaying an image intended to be looked at by a human vision system, the matrix display device comprising:
a plurality of pixels, said pixels comprising at least three sub-pixels, each sub-pixel intended for generating a sub-pixel colour which cannot be obtained by a linear combination of the sub-pixel colours of the other sub-pixels of the pixel,
10 a first memory for storing first characterisation data for a human vision system,
a second memory for storing second characterisation data for at least one defect sub-pixel present in the display device, the defect sub-pixel being intended for generating a first sub-pixel colour,
15 a modulation device for modulating, in accordance with the first characterisation data and the second characterisation data, drive signals for non-defective sub-pixels surrounding a defect sub-pixel so as to reduce the visual impact of the defect sub-pixel present in the matrix display device, wherein modulating drive signals comprises changing the
20 light output value of at least one non-defective sub-pixel intended for generating another sub-pixel colour, said another sub-pixel colour differing from said first sub-pixel colour.
- 17.- A matrix display device according to claim 16, wherein the first and the second memory are physically a same memory device.
- 25 18.- A control unit for use with a system for reducing the visual impact of defects present in a matrix display comprising a plurality of pixels, said pixels comprising at least three sub-pixels, each sub-pixel intended for generating a sub-pixel colour which cannot be obtained by a linear combination of the sub-pixel colours of the other sub-pixels of the pixel,
30 and intended to be looked at by a human vision system, the control unit comprising:
a first memory for storing first characterisation data for a human vision system,

a second memory for storing second characterisation data for at least one defect sub-pixel present in the display, the defect sub-pixel intended for generating a first sub-pixel colour and
modulating means for modulating, in accordance with the first
5 characterisation data and the second characterisation data, drive signals for non-defective sub-pixels surrounding the defect sub-pixel so as to reduce the visual impact of the defect sub-pixel, wherein modulating drive signals comprises changing the light output value of at least one non-defective sub-pixel intended for generating another sub-pixel colour, said
10 another sub-pixel colour differing from said first sub-pixel colour.